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Kyle

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(54) **SURVEILLANCE CAMERA ASSEMBLY FOR A CHECKOUT SYSTEM**

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(51) **Int. Cl.**

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G08B 13/24	(2006.01)
A47F 9/04	(2006.01)

(52) **U.S. Cl.**

CPC ***G07G 1/0036*** (2013.01); ***G08B 13/248*** (2013.01); *A47F 9/046* (2013.01)

(58) **Field of Classification Search**

USPC 348/150

See application file for complete search history.

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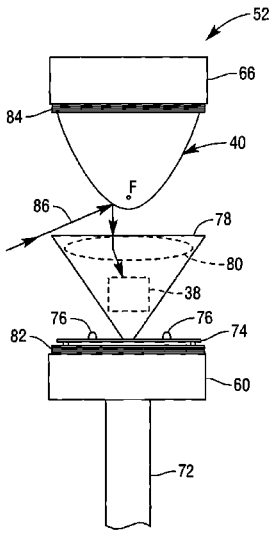
(57) **ABSTRACT**

A surveillance camera assembly for a checkout system which captures images of a checkout environment. The surveillance camera assembly includes a panoramic mirror and a camera for capturing images of a checkout environment. The camera sends the images to a security computer.

14 Claims, 3 Drawing Sheets



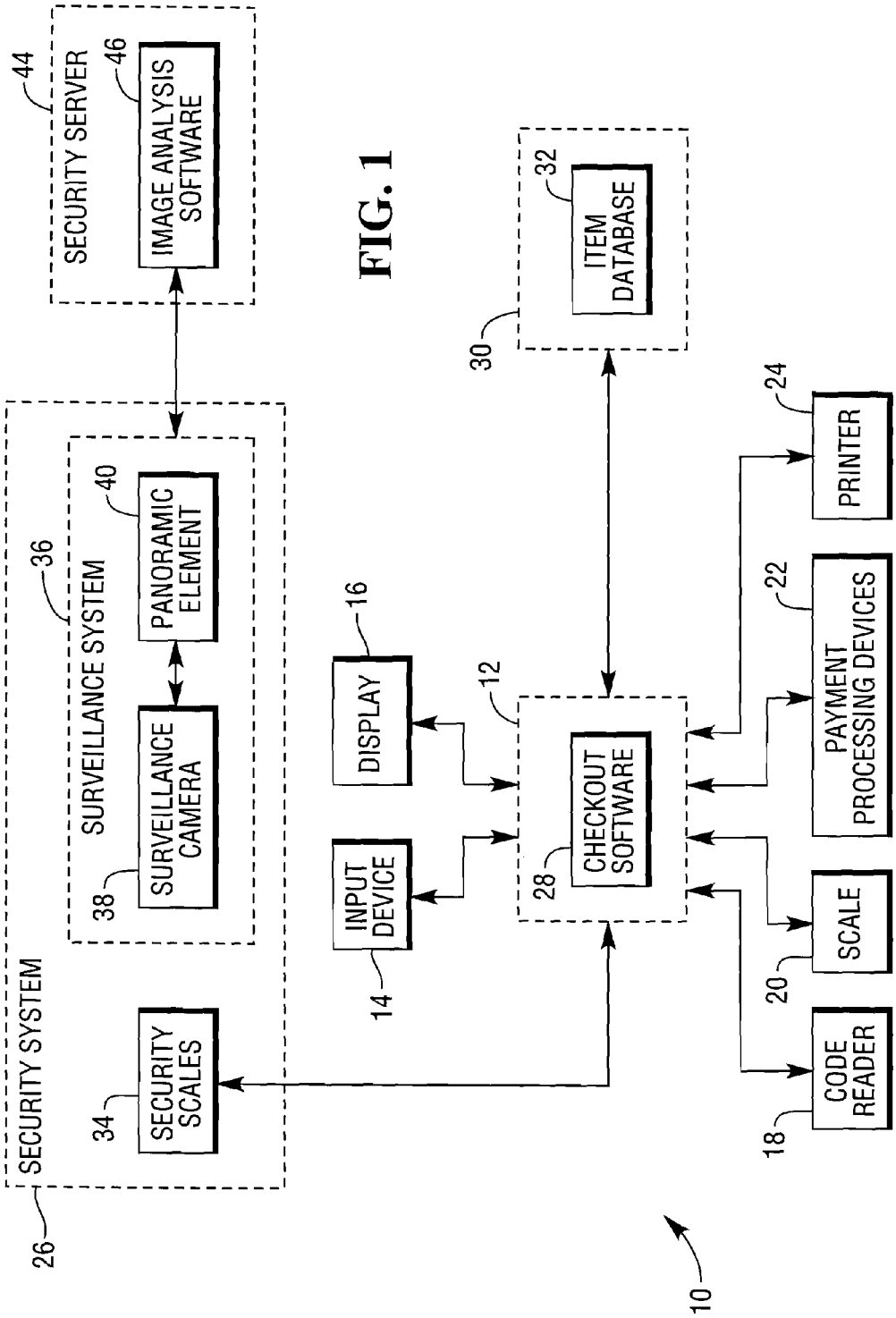

SECURITY SERVER
44
IMAGE ANALYSIS SOFTWARE
46
ITEM DATABASE
32
30
PRINTER
24
SECURITY SYSTEM
SURVEILLANCE SYSTEM
36
PANORAMIC ELEMENT
40
SURVEILLANCE CAMERA
38
DISPLAY
16
INPUT DEVICE
14
CHECKOUT SOFTWARE
28
12
PAYMENT PROCESSING DEVICES
22
SECURITY SCALES
34
SCALE
20
CODE READER
18
26
10

FIG. 1

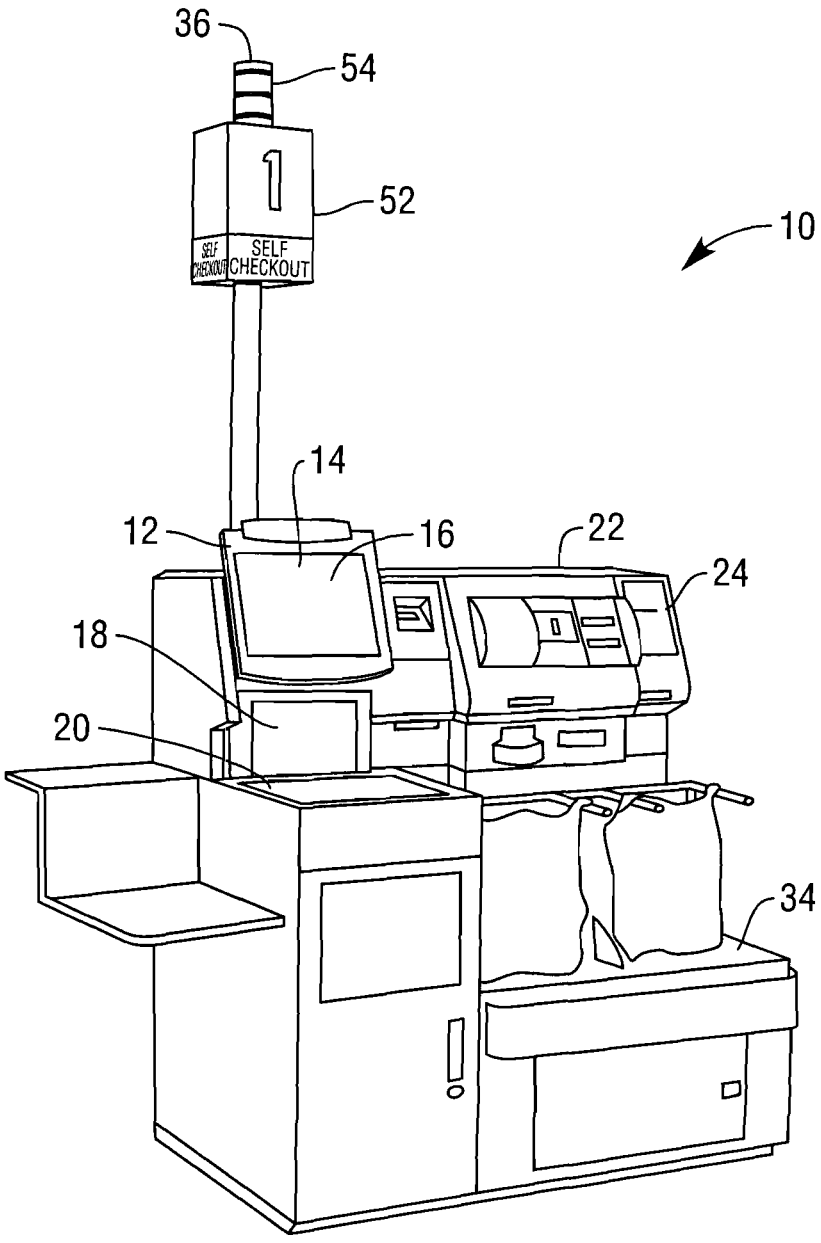


FIG. 2

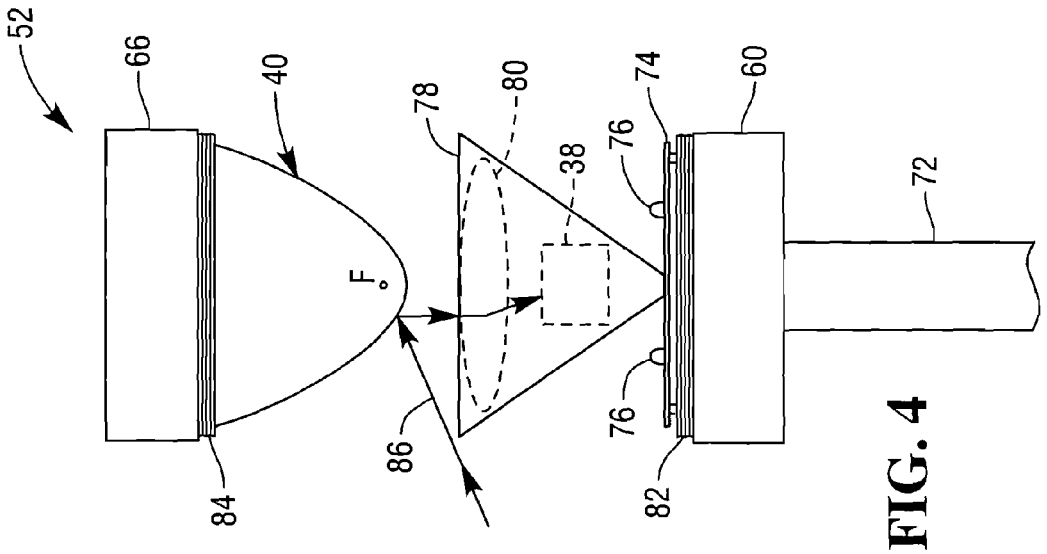


FIG. 4

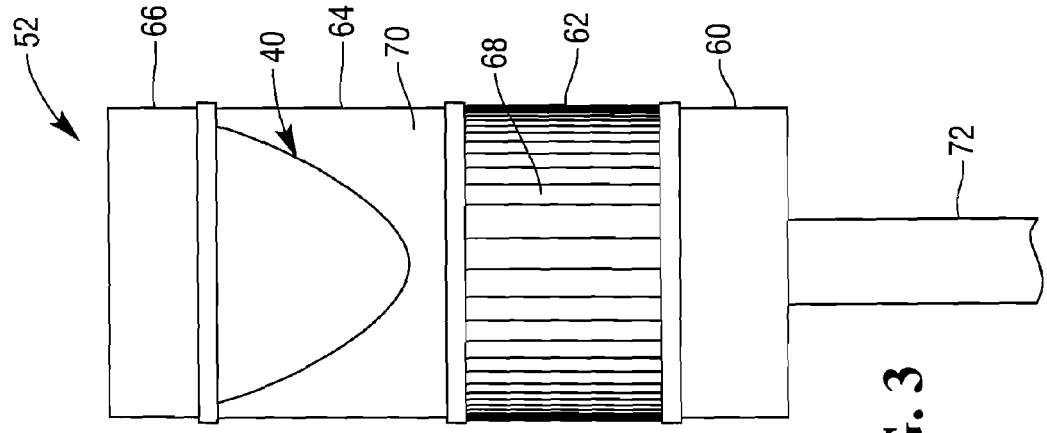


FIG. 3

SURVEILLANCE CAMERA ASSEMBLY FOR A CHECKOUT SYSTEM

BACKGROUND

One problem associated with checkout operations is the need to prevent theft. This concern is applicable in employee operated systems, but is of particular importance in the context of customer operated self checkout systems. If a transaction is not closely monitored, numerous opportunities exist for an unscrupulous customer to take merchandise without entering it into a transaction.

It would be desirable to provide a surveillance camera assembly for a checkout system to address these concerns.

SUMMARY

A surveillance camera assembly for a checkout system is provided.

A surveillance camera assembly for a checkout system which includes a camera for capturing images of a checkout environment and a panoramic mirror for directing the images to the camera. The camera sends the images to a security computer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an example checkout system according to an aspect of the present invention.

FIG. **2** illustrates an example embodiment of a checkout station.

FIGS. **3-4** illustrate an example light indicator including a surveillance system.

DETAILED DESCRIPTION

With reference to FIG. **1**, checkout system **10** includes computer **12**, input device **14**, display **16**, code reader **18**, scale **20**, payment processing device **22**, printer **24**, and security system **26**.

Computer **12** includes a processor, operating memory, and long term storage. Computer executes checkout software **28**, which records item identification information via input device **14** or code reader **18**, item weight information (in the case of produce items) via scale **20**, obtains item price information from item database **32**, tallies prices of purchased items, records payment for the purchased items, and prints a receipt evidencing the payment for the purchased items via printer **24**.

Input device **14** may include a keyboard.

Display **16** may include a liquid crystal display (LCD). Alternatively, input device **14** and display **16** may be combined as a touch screen.

Code reader **18** reads item identification information stored in codes on purchased items. Code reader **18** may include a barcode reader (e.g., a laser-based barcode reader and/or an imager-based barcode reader) or radio frequency identification (RFID) tag reader or both. Code reader **18** may be fixed mounted or portable or include both.

Scale **20** records weights of produce items. Scale **20** includes one or more load cells and a weigh plate. Scale **20** and code reader **18** may be combined into a single peripheral.

Payment processing device **22** may read payment, loyalty, and identification cards. Payment processing device **22** may include one or more payment peripherals, including a card (e.g., credit, debit, smart, loyalty, check) reader, cash (e.g., coin and/or currency) acceptor, cash (e.g., coin and/or currency) dispenser, cash drawer, and signature capture device.

Printer **24** may print receipts, coupons, vouchers, ads, and promotions. Printer **24** may include a thermal printer capable of printer on one or both sides of paper roll stock.

Security system **26** includes security scales **34** and surveillance system **36**. Security scales **34** may be located in bag wells and set aside shelves and be controlled by computer **12**.

Surveillance system **36** includes surveillance camera **38** and panoramic element **40**. Surveillance camera **38** captures images of customer activity, including customer handling of products, during transactions at checkout system **10** and neighboring checkout systems **10**. Panoramic element **40** provides surveillance camera **38** with visibility around checkout system **10**.

Surveillance camera **38** may be controlled independently of computer **12**. Images from camera **38** may be captured by computer **12** or a separate computer, such as security server **44**. Security server **44** may execute image analysis software **46** for analyzing the images for improper customer behavior and alerting security personnel. Surveillance camera **38** may be a network device, with its own internet protocol (IP) address. Surveillance camera **38** may alternatively be controlled by computer **12**, for example, via a universal serial bus (USB) connection.

With reference to FIG. **2**, an example embodiment of a checkout station **50** is illustrated. In addition to computer **12**, input device **14**, display **16**, code reader **18**, scale **20**, payment processing device **22**, printer **24**, and security system **26**, checkout station **50** includes lane indicator **52**.

Lane indicator **52** includes a light portion **62** controlled by computer **12** for summoning a store attendant, such as a customer service manager, if intervention into a current checkout transaction is needed. Intervention may be required to assist a customer. Alternatively, intervention may be required for security or maintenance reasons.

In this example embodiment, lane indicator **52** further includes surveillance system **36**.

Lane indicator **52** may also include a sign **54** with a reference numeral corresponding to the identity of checkout system **10** among a plurality of checkout systems **10**.

With reference to FIGS. **3-4**, an example lane indicator **52** is illustrated.

Example lane indicator **52** includes base **60**, light portion **62**, surveillance portion **64**, and top **66**. Example lane indicator **52** is substantially cylindrical in shape.

Base **60** provides a bottom mounting platform and mounts to pole **72**.

Light portion **62** is capable of producing one or more different colors of light associated with different assistance scenarios. Light portion **62** includes printed circuit board **74**, which is mounted to base **60**.

Lights **76** and conical section **78** are mounted to printed circuit board **74**. Lights **76** may include light emitting diodes. Conical section **78** is mounted at or near the center of printed circuit board **74** and has a mirrored surface for changing the direction of light from lights **76** towards diffuser **68**.

Diffuser **68** scatters light from light portion **62** evenly around light **54**. Diffuser **68** is general cylindrical in shape, but the outer surface includes triangular protrusions that accomplish the scattering. FIG. **4** illustrates lane indicator **52** with diffuser **68** removed.

Light section **62** may further include portions of surveillance system **36**. Camera **38** and focusing lens **80** are located within conical section **78**, which is hollow, with the aperture of camera **38** pointing upwards. Electrical connections

between camera **38** and printed circuit board **74** are made through an aperture in the bottom of conical section **78**.

Surveillance portion **64** includes panoramic element **40** and window **70**. In this example, panoramic element **40** includes a panoramic mirror. Panoramic element **40** gives camera **38** a visibility of 360° around checkout system **10**. Panoramic element **40** may be shaped like a three-dimensional parabolic surface with its vertex oriented below its circular end and its focal point F above the vertex. Use of a parabola shape results in all light directed to focal point F reflecting in a substantially vertical direction downwards towards focusing lens **80**. Panoramic element **40** is centered over camera **38**. FIG. **4** illustrates lane indicator **52** with window **70** removed.

Panoramic element **40** may alternatively include a hyperbolic mirror assembly.

The diameter of lens **80** is substantially as large as the diameter of panoramic element **40** in order to maximize the amount of light captured from panoramic element **40**.

Window **70** is substantially transparent. Window **70** and diffuser **68** may be one unit or coupled together. The bottom end of diffuser **68** may be threaded for coupling to corresponding threads **82** of base **60**. The top end of window **70** may be threaded for coupling to corresponding threads **84** of top **66**. Other assembly methods are also envisioned.

Example light ray **86** passes through window **70** and reflects vertically downward from panoramic mirror **78** to focusing lens **80**. Focusing lens **80** concentrates the light towards camera **38**.

Dimensions of elements in lane indicator **52** may be established to minimize the amount of area around pole **72** that is not visible to camera **38**. In the example lane indicator **52**, the height of pole **72**, the diameter of panoramic section **64**, the distance between camera **38** and the vertex of panoramic mirror **78**, and the size and position of may be established consistent with a desired viewing area around pole **72**. In the illustrated example, the non-viewable area may be as much as a conic of about 30 degrees (15 degrees rotated about the central axis).

Image analysis software **46** processes information captured by camera **38**. For example, image analysis software **46** may complete a pixel for pixel mapping from a polar coordinate space to a Cartesian or rectangular coordinate space.

Although particular reference has been made to certain embodiments, variations and modifications are also envisioned within the spirit and scope of the following claims.

What is claimed is:

1. A camera assembly for a checkout system comprising:
- a camera aimed in a direction away from a checkout environment for capturing images of the checkout environment;
- a lens; and
- a panoramic mirror separate from the lens for directing the images to the camera through the lens wherein the focal point for the panoramic mirror is oriented below its circular end and above its vertex and wherein light directed to the focal point is reflected in a substantially vertical direction toward the lens, wherein the camera and the lens are situated within a conical section that is hollow and an aperture of the camera pointing upward and a checkout environment direction for the checkout environment is downward;
- wherein the camera sends the images to a security computer.

2. The camera assembly of claim **1**, wherein the panoramic mirror comprises a parabolic mirror.

3. The camera assembly of claim **1**, wherein the panoramic mirror comprises a hyperbolic mirror.

4. A checkout lane indicator comprising:
- a security portion including
  - a camera aimed in a direction away from a checkout environment for capturing images of the checkout environment;
  - a lens; and
  - a panoramic mirror separate from the lens for directing the images to the camera through the lens wherein the focal point for the panoramic mirror is oriented below its circular end and above its vertex and wherein light directed to the focal point is reflected in a substantially vertical direction toward the lens, and wherein the camera and the lens are situated within a conical section that is hollow and an aperture of the camera pointing upward and a checkout environment direction for the checkout environment is downward; and
- a light portion adjacent the security portion including a light emitter.

5. The checkout lane indicator of claim **4**, wherein the panoramic mirror comprises a parabolic mirror.

6. The checkout lane indicator of claim **4**, wherein the panoramic mirror comprises a hyperbolic mirror.

7. The checkout lane indicator of claim **4**, wherein the light portion further comprises:
- a printed circuit board, wherein the light emitter is mounted to the printed circuit board; and
- a conical mirror on the printed circuit board for changing a direction of light from the light emitter.

8. The checkout lane indicator of claim **4**, wherein the light emitter comprises a light emitting diode.

9. The checkout lane indicator of claim **4**, wherein the security portion further comprises a transparent window around the panoramic mirror.

10. The checkout lane indicator of claim **4**, wherein the security portion is controlled by a security computer.

11. The checkout lane indicator of claim **7**, wherein the light portion further comprises a diffuser for scattering the light.

12. The checkout lane indicator of claim **10**, wherein the security computer comprises a checkout computer adjacent the checkout lane indicator.

13. The checkout lane indicator of claim **10**, wherein the security computer comprises a server.

14. A checkout lane indicator comprising:
- a base;
- a light portion on the base including
  - a printed circuit board;
  - a plurality of light emitters on the printed circuit board;
  - a conical mirror on the printed circuit board for reflecting light from the light emitters; and
  - a diffuser window around the conical mirror; and
- a surveillance portion including:
  - a camera in the conical mirror aimed in a direction away from a checkout environment for capturing images of the checkout environment;
  - a lens;
  - a panoramic mirror separate from the lens for directing the images to the camera through the lens wherein the focal point for the panoramic mirror is oriented below its circular end and above its vertex and wherein light directed to the focal point is reflected in a substantially vertical direction toward the lens, and wherein the camera and the lens are situated within a conical section that is hollow and an aperture of the camera

pointing upward and a checkout environment direction for the checkout environment is downward; and

a transparent window around the panoramic mirror;

wherein the camera sends the images to a security computer.

* * * * *